



A.D. 1868, 19th SEPTEMBER.

N^o 2883.

S P E C I F I C A T I O N

OF

WILLIAM HENRY HUGHAN.

FOR IMPROVING AND TREATING AND DEODORIZING SEWAGE, &c.

L O N D O N :

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A.D. 1868, 19th SEPTEMBER. N° 2883.

Treating and Deodorizing Sewage, &c.

LETTERS PATENT to William Henry Hughan, of Newton Stewart, North Britain, Postmaster and Guano and Seed Merchant, for the Invention of “**IMPROVEMENTS IN THE TREATMENT OF NIGHT SOIL, SEWAGE, AND OTHER LIKE REFUSE MATTERS FOR THE PURPOSE OF DEODORISING AND CONVERTING THE SAME INTO MANURE.**”

Sealed the 16th March 1869, and dated the 19th September 1868.

PROVISIONAL SPECIFICATION left by the said William Henry Hughan at the Office of the Commissioners of Patents, with his Petition, on the 19th September 1868.

I, **WILLIAM HENRY HUGHAN**, of Newton Stewart, North Britain, 5 Postmaster and Guano and Seed Merchant, do hereby declare the nature of the said Invention for “**IMPROVEMENTS IN THE TREATMENT OF NIGHT SOIL, SEWAGE, AND OTHER LIKE REFUSE MATTERS FOR THE PURPOSE OF DEODORISING AND CONVERTING THE SAME INTO MANURE,**” to be as follows:—

The object of this Invention is accomplished by the process of 10 cementation, and what I claim to have discovered is, the application of

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“Portland” or other suitable cement in the setting process to deodorise (where necessary) and solidify night soil, sewage, filth in general, refuse, blood, offal, urinary and bestial products of farm steadings, sludge, and other refuse of manufactories, fish, and the like.

The primary object of the discovery is to utilize night soil and the contents of sewers and other like refuse matter found in large cities and towns (which substances are known to be rich in ammonia, phosphoric acid, magnesia, potash, soda, and which at present poison the air and water) and to transform them into a valuable and portable substance or manure for agricultural purposes. The contents of the sewers and cesspools containing the nightsoil and other like refuse are introduced into a mortar mill or such like grinding or reducing machinery, and therein ground up and mixed with cement to the consistency and prepared condition of mortar; after withdrawal from the mill the product begins to set into a hard substance ultimately like a stone. Deodorisation commences with the contact of the cement and proceeds with the setting property until in a few hours the substance becomes as inodorous as imported guano and without injury to its fertilizing properties. When the setting process is completed in sufficient hardness it is crushed down into powder and is then fit for use. In correct nomenclature I would now call the powder “carbonic acid guano.” It may be further improved by the addition of acids, or by calcination whilst in the indurated condition, but I prefer it in the carbonic acidised state. An improvement in effectual deodorisation is caused by the addition of peat charcoal, salt to the raw material when in the mortar mill, and it may also be enriched with bone ash and other known fertilizing elements, and I therefore reserve the right of introducing into the mixture all salts, acids, alkalies, earths, refuse from alum, oil, alkali, cotton, wool, gas, soot, and tannery manufactories and ironfoundries for the manufacture of given manures, as well as the applying of cement to the mixing of substances for improvement or extract.

For my purpose of cementation I manufacture a special cement having powerful absorption, setting rapidly, and then disintegrating into powder, but of all the cements at present in use I prefer the hydraulic building “Portland cement,” on account of its great powers of absorption and its rapid setting properties.

It being an established fact that manures are improved in general effect by admixture with one another the application of cement for this

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purpose is claimed. It must be used with water, the cement being in the same proportion as when mixed with sand for mortar; carbonic acid is formed by the setting process, and as this element is as essential to the life of plants as ammonia and as difficult for the plants to forage, this
5 ready presentation (in an available form) of carbonic acid must prove of material service to the growth of the plants, and therefore in the manufacture of my manures from night soil and such like refuse matter by my system of cementation every encouragement will be given to the generation of carbonic acid by introducing peat charcoal and other
10 sources of carbon to be acted upon by salts and the creative principle of carbonic acid in the setting process of the cement. The carbonic acid may be said to be in a soluble state as found in the crushed down cemented night soil; and I claim the extension of this principle in all mortars and cements when set with water, and afterwards ground up into
15 powder for agricultural purposes. I also claim the direct absorption of acids by the setting process into cement for agricultural purposes, and more particularly the production of carbonic acid; and I further claim the use of carbonic acid as a manure in a direct, pure, or mixed form. I may add that when I use Portland cement in the cementation of
20 night soil and sewage I allow the set substance to remain in that form for a few weeks, until all feculent odour is absorbed before crushing into powder. Spontaneous cementation may be attempted by allowing the nightsoil or other matters treated to flow over or through the cement.

25 SPECIFICATION in pursuance of the conditions of the Letters Patent, filed by the said William Henry Hughan in the Great Seal Patent Office on the 17th March 1869.

TO ALL TO WHOM THESE PRESENTS SHALL COME, I, WILLIAM HENRY HUGHAN, of Newton Stewart, North Britain, Postmaster and
30 Guano and Seed Merchant, send greeting.

WHEREAS Her most Excellent Majesty Queen Victoria, by Her Letters Patent, bearing date the Nineteenth day of September, in the year of our Lord One thousand eight hundred and sixty-eight, in the thirty-second year of Her reign, did, for Herself, Her heirs and suc-
35 cessors, give and grant unto me, the said William Henry Hughan,

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Her special license that I, the said William Henry Hughan, my executors, administrators, and assigns, or such others as I, the said William Henry Hughan, my executors, administrators, or assigns, should at any time agree with, and no others, from time to time and at all times thereafter during the term therein expressed, should and lawfully 5 might make, use, exercise, and vend, within the United Kingdom of Great Britain and Ireland, the Channel Islands, and Isle of Man, an Invention for "IMPROVEMENTS IN THE TREATMENT OF NIGHT SOIL, SEWAGE, AND OTHER LIKE REFUSE MATTERS FOR THE PURPOSE OF DEODORIZING AND CONVERTING THE SAME INTO MANURE," upon the condition (amongst others) that I, the 10 said William Henry Hughan, by an instrument in writing under my hand and seal, should particularly describe and ascertain the nature of the said Invention, and in what manner the same was to be performed, and cause the same to be filed in the Great Seal Patent Office within six calendar months next and immediately after the date 15 of the said Letters Patent.

NOW KNOW YE, that I, the said William Henry Hughan, do hereby declare the nature of my said Invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement, that is to say :— 20

My said Invention relates essentially to the application of Portland, Roman, or other suitable cement to deodorise (where necessary) and solidify night soil, sewage, filth, urinary and bestial products of farm steadings, sludge, the waste of manufactories, and refuse in general.

The primary object of this Invention is to utilize night soil and the 25 contents of sewers and other like refuse matter found in large cities or towns, which substances are known to be rich in ammonia, phosphoric acid, magnesia, potash, and soda, and which at present poison the air and pollute our rivers, and to transform these substances into a valuable and portable product or manure for agricultural purposes. In cases 30 where the night soil, sewage, or other refuse material can be obtained in a comparatively solid form it may at once be treated by introducing it into a mortar mill, otherwise known as a pan mill or other suitable apparatus, and therein ground and mixed with cement to the consistency of prepared mortar. But in treating sewage where the water or impure 35 liquid predominates it may while flowing be mixed with cement at any convenient part of its course through the sewers, as in large cities or towns. One mode of mixing the sewage while flowing is carried out by

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placing a wheel in the course of the sewer, and which may be driven by the force of the flowing sewage. A hopper is fixed over this wheel, into which hopper the powdered cement is filled, and from which the discharge of cement may be regulated according to the volume and density
5 of sewage to be treated or mixed. The sewage thus impregnated is conducted to a tank or reservoir, in which the cement settles and precipitates with it to the bottom all the mineral and organic matters, urea, ammonia, phosphoric acid, and salts, leaving a comparatively pure water, which may be run off or pumped off as circumstances may require. A
10 series of such tanks or reservoirs may be used, into which the impregnated sewage may be conducted successively according to the requirements of the process. Instead of impregnating the sewage while flowing with the cement, it may be conducted to proper tanks or reservoirs and therein churned by any suitable means or appliance. As the mechanical
15 appliances or apparatus for mixing the sewage and cement form no part of the present Invention, therefore no further modifications of them need be referred to, as it will at once be evident to a practitioner that as different kinds of sewage, night soil, and other refuse required to be treated or mixed, different appliances for effecting the admixture are
20 necessary to be adopted according to circumstances; the process of cementing sewage and other refuse matter therefore constitutes the essential feature of this Invention.

The product obtained after the subsidence of the sewage by cementation, and after the supernatant liquid is run off may be introduced into the
25 mortar mill or other apparatus and there mixed with more cement until it reaches the required degree of consistency. After withdrawal from the mill or other apparatus the product begins to set into a hard substance. Deodorization commences with the contact of the cement and proceeds with the setting of the latter, until in a few hours the substance
30 becomes as dry and inodorous as imported guano without injury to its fertilizing properties. When the setting process has rendered the mixture sufficiently hard and dry it may be crushed down by suitable machinery into powder for use as a manure. In correct nomenclature I would now call the powder "carbonic acid guano." When Portland or Roman
35 cement is used in the mixing process it may be further improved by the addition of acids or salts, or by calcination whilst in the indurated condition, but when the Portland or Roman cements are mixed with the proportion of copperas, as herein-after explained, or the special cement,

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herein-after mentioned, are to be employed it is unnecessary to mix with acids or calcine the product. Any salt remaining in the sewage water after subsidence of the other solid portions can easily be precipitated, if desired, by a series of cements of which clay and other salts from the basis. An improvement in effectual deodorization is caused by the 5 addition of peat charcoal and salt to the raw material when in the mortar mill or mixing apparatus, and it may also be enriched with bone ash, salts, acids, alkalies, earths, and refuse in general from manufactories or elsewhere for the manufacture of any desired quality of manure. 10

For the purpose of cementation I prefer to manufacture a special cement having powerful absorption, setting rapidly, and then disintegrating into powder. It is by preference composed of four parts of alum and one part of clay or sulphate or phosphate of lime in solution with water, the mixture to be boiled until dry and afterwards calcined; 15 a small proportion of caustic lime or phosphates may be added. Devonshire clay calcined with a proportion of alum is the most suitable for finally cementing the precipitate sewage into a dry manure. Of all the cements at present in use I prefer "hydraulic building Portland cement" or "Roman cement," on account of their great power of absorption 20 and rapid setting propensities either in or out of water. It is found by experiment that Portland or Roman cement mixed with one part of copperas to six parts of the cement entirely fixes the ammonia of the sewage and prevents its escape, thus proving a valuable deodoriser and specially suited for the process of cementation of sewage, night soil, and 25 other refuse. The proportion of copperas named may be augmented to equal parts with the cement dependent upon the putrescent character or density of the sewage.

It being generally understood that manures are improved in effect by admixture with one another, the application of cement for this purpose 30 forms another part of this Invention. It is used with water, the cement being in the same proportion as when mixed with sand for mortar; carbonic acid is formed during the setting process, and as this element is as essential to the life of plants as ammonia, this ready presentation (in an available form) of carbonic acid proves a material service to the 35 growth of the plants, and therefore in the manufacture of manures from night soil, sewage, and such like refuse matters by the system of cementation herein-before set forth, the generation of carbonic acid is rendered

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very effectual and is further increased by introducing peat charcoal and other sources of carbon. The carbonic acid may be said to be in a soluble state as found in the crushed down sewage after cementation, and the extension of this principle in all mortars and cements when set
5 with water and afterwards ground up into powder for agricultural purposes, and the direct absorption of acids (more particularly carbonic acid) by the setting process into cement for agricultural purposes forms a very important feature of this Invention. Spontaneous cementation may be effected by allowing the sewage to flow over or through the
10 cement, and the cement can also be introduced into night soil closets after the dry earth system producing deodorization and cementation upon contact with the excreta regulated by suitable machinery.

Having now described the nature of my said Invention, and the manner in or under which the same is or may be used or practically
15 carried into effect, I would observe in conclusion that what I consider novel and original, and therefore claim as the Invention secured to me by the herein-before in part recited Letters Patent is,—

First. The cementation of sewage, night soil, and the other refuse matters herein set forth for the purpose of converting the same into
20 useful manurial products so as to deodorise and render the same non-injurious to health, as herein-before described.

Second. The combination of substances constituting the special cement to be used for treating sewage and other refuse, in the manner herein-before described.

25 In witness whereof, I, the said William Henry Hughan, have hereunto set my hand and seal, this Thirteenth day of March One thousand eight hundred and sixty-nine.

WILLIAM HENRY HUGHAN. (L.S.)

LONDON :

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